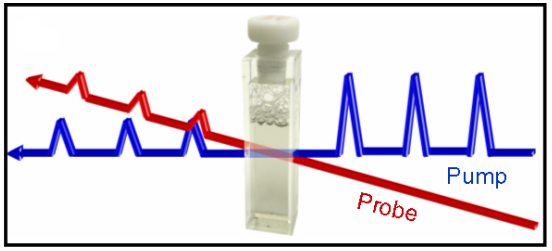
Infrared Optical Stimulated Emission from Isolated Single Walled Carbon Nanotubes

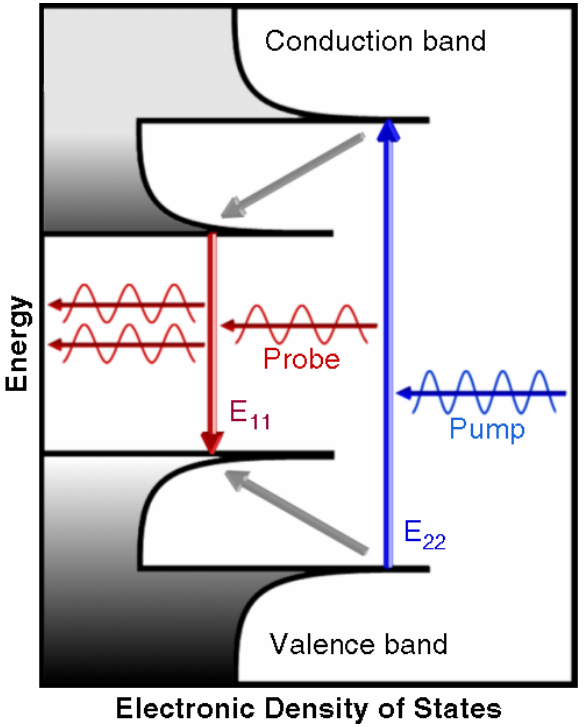
Mark C. Hersam, Northwestern University, DMR-0134706

Intellectual Merit:

Infrared optical amplifiers and LASERs (Light Amplification by Stimulated Emission of Radiation) play a central role in fiber optic communications and medical imaging. At Northwestern University, the phenomenon of stimulated emission of infrared light from single-walled carbon nanotubes (SWNTs) has recently been demonstrated. The unique atomic structure of a SWNT – which resembles a small cylinder of graphite with a diameter of one nanometer – allows the optical properties of this material to be widely tunable. By coupling this new understanding with pre-existing SWNT electronics technology, a new class of sophisticated optical computing systems may be realized in the future.

Nano Letters, web release date: October 4, 2003.





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Broader Impacts:

Several undergraduates including two women and three underrepresented minorities contributed to this project while participating in the Research Experience for Undergraduates (REU) program: Steve Akuamoah, Andrew Baluch, Maryjoy Carnate, Samantha Cruz, Shaun Elder, Matthew Schmitz, and Christian Valley.

This research has also been incorporated into a new undergraduate course in the Department of Materials Science and Engineering entitled "Nanomaterials." This course employs novel pedagogical techniques such as interdisciplinary group learning and peer assessment.

Journal of Engineering Education, scheduled publication date: January, 2004.

The PI describes the operation of an ultra-high vacuum scanning tunneling microscope to three REU students (from left to right: Samantha Cruz, Shaun Elder, Mark Hersam, and Steve Akuamoah).